

WHAT IS CLAIMED IS:

1. A prepreg, comprising a substrate impregnated with a thermally conductive resin.
2. The prepreg of claim 1, wherein the substrate material includes carbon.
3. The prepreg of claim 2, wherein the substrate contains woven carbon fibers.
4. The prepreg of claim 2, wherein the substrate includes unidirectional carbon fibers.
5. The prepreg of claim 1, wherein the substrate includes fiberglass.
6. The prepreg of claim 1, wherein the substrate includes kevlar.
7. The prepreg of claim 1, wherein the substrate includes aramid.
8. The prepreg of claim 1, wherein the substrate includes quartz.
9. The prepreg of claim 1, wherein the thermally conductive resin contains a boron nitride additive.
10. The prepreg of claim 1, wherein the thermally conductive resin contains a diamond powder additive.

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11. The prepreg of claim 1, wherein the thermally conductive resin contains an aluminum oxide additive.

12. The prepreg of claim 1, wherein the thermally conductive resin has a thermal conductivity in excess of 1.25 W/m.K.

13. The prepreg of claim 12, wherein the thermally conductive resin has a thermal conductivity in excess of 2.5 W/m.K.

14. The prepreg of claim 1, wherein the thermally conductive resin is also electrically conductive.

15. The prepreg of claim 14, wherein the prepreg has a dielectric constant greater than 6.0 at 1 MHz.

16. The prepreg of claim 14, wherein the electrically and thermally conductive resin contains a pyrolytic carbon additive.

17. The prepreg of claim 14, wherein the electrically and thermally conductive resin contains a silver oxide additive.

18. The prepreg of claim 14, wherein the electrically and thermally conductive resin contains carbon powder as an additive.

19. The prepreg of claim 14, wherein the electrically and thermally conductive resin has a dielectric constant greater than 6.0 at 1 MHz.

20. A laminate, comprising:

a prepreg, comprising a substrate impregnated with a thermally conductive resin;

a first layer of electrically conductive material positioned above the prepreg; and

a second layer of electrically conductive material positioned below the prepreg.

21. The laminate of claim 20, wherein the thermally conductive resin has a thermal conductivity in excess of 1.25 W/m.K.

22. The laminate of claim 21, wherein the thermally conductive resin has a thermal conductivity in excess of 2.5 W/m.K.

23. The laminate of claim 20, wherein the thermally conductive resin is also electrically conductive.

24. The laminate of claim 23, wherein the electrically and thermally conductive resin has a dielectric constant greater than 6.0 at 1 MHz.

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25. A laminate, comprising:

a substrate;

a first prepreg layer positioned above the substrate;

a second prepreg layer positioned below the substrate;

5 a first layer of electrically conductive material positioned above the first prepreg layer; and

a second layer of electrically conductive material positioned below the second prepreg layer; and

wherein the dielectric constant of the laminate is greater than 6.0 at 1 MHz.

10 26. The laminate of claim 25, wherein the prepreps contain electrically and thermally conductive resin.

27. The laminate of claim 26, wherein the prepreg has a dielectric constant greater than 6.0 at 1 MHz.

15 28. The laminate of claim 26, wherein the electrically and thermally conductive resin has a dielectric constant greater than 6.0 at 1 MHz.

29. A printed wiring board, comprising:

an electrically and thermally conductive laminate;

20 a first dielectric layer positioned above the electrically and thermally conductive laminate; and

a second dielectric layer positioned below the electrically and thermally conductive laminate.

30. The printed wiring board of claim 29, wherein:  
the electrically and thermally conductive laminate has a dielectric constant greater than 6.0 at 1 MHz; and  
the first and second prepreg layers have dielectric constants less than 6.0 at 1 MHz.

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31. The printed wiring board of claim 29, wherein:  
the electrically and thermally conductive laminate is configured to carry an electrical load sufficient for the laminate to act as a ground plane in the printed wiring board.

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32. The printed wiring board of claim 29, wherein:  
the electrically and thermally conductive laminate is configured to carry an electrical load sufficient for the laminate to act as a power plane in the printed wiring board.

33. The printed wiring board of claim 29, wherein:  
the electrically and thermally conductive laminate is partitioned such that a first portion of the electrically and thermally conductive laminate is configured to carry an electrical load sufficient for the first portion to act as a power plane in the printed wiring board and a second portion of the electrically and thermally conductive laminate is configured to carry an electrical load sufficient for the second portion to act as a ground plane in the printed wiring board.

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34. The printed wiring board of claim 29, wherein:  
the electrically and thermally conductive laminate comprises:  
a prepreg, comprising a substrate impregnated with an electrically or thermally conductive resin;

a first layer of electrically conductive material positioned above the prepreg; and  
a second layer of electrically conductive material positioned below the prepreg.

35. The printed wiring board of claim 29, wherein:

5 the electrically and thermally conductive laminate comprises:

a substrate;

a first prepreg layer positioned above the substrate;

a second prepreg layer positioned below the substrate;

a first layer of electrically conductive material positioned above the first prepreg layer; and

10 a second layer of electrically conductive material positioned below the second prepreg layer; and

wherein the dielectric constant of the laminate is greater than 6.0 at 1 MHz.

36. The printed wiring board of claim 29, also comprising:

at least one additional prepreg layer;

15 at least one additional layer of electrically conductive material;

wherein the electrically and thermally conducting laminate, the additional prepreg layers and the  
additional layers of electrically conductive material are positioned adjacent each other;

wherein at least one prepreg layer is located between each of the additional layers of electrically  
conductive material; and

20 wherein at least one prepreg layer is located between each of the additional layers of electrically  
conductive material and the electrically and thermally conducting laminate.

37. The printed wiring board of claim 36, also comprising:

at least one additional electrically and thermally conducting laminate;

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wherein at least one prepreg layer is located between each of the additional layers of electrically conductive material and the additional electrically and thermally conductive laminates; and

wherein at least one prepreg layer is located between each of the electrically and thermally conductive laminates.

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38. The printed wiring board of claim 37, also comprising:

at least one layer containing carbon;

wherein at least one prepreg layer is located between each of the additional layers of electrically conductive material and the layers containing carbon; and

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wherein at least one prepreg layer is located between the electrically and thermally conductive laminates and the layers containing carbon.

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39. The printed wiring board of claim 29, wherein the printed wiring board includes a plurality of lined holes that extend from a surface of the printed wiring board through the electrically and thermally conductive laminate.

40. The printed wiring board of claim 39, wherein the lining of the lined holes is a thermally conductive material.

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41. The printed wiring board of claim 40, wherein the lining of the lined holes has a thermal conductivity greater than 1.25 W/m.K.

42. The printed wiring board of claim 41, wherein the lining of the lined holes has a thermal conductivity greater than 2.5 W/m.K.

FOOTNOTES

43. The printed wiring board of claim 39, wherein the lining of the lined holes is an electrically and thermally conductive material.

44. The printed wiring board of claim 43, wherein the lining of the lined holes is copper.

45. The printed wiring board of claim 37, wherein:

the electrically and thermally conductive laminate also comprises:

a plurality of through holes extending through said printed wiring board for providing electrical connection between at least two of said layers;

an electrically conductive lining within the through holes; and

at least one annulus of dielectric material disposed at preselected locations between the electrically conductive lining and the electrically and thermally conductive laminate.

46. The printed wiring board of claim 45, where the annuli are constructed from material having a dielectric constant less than 6.0 at 1 MHz.

47. The printed wiring board of claim 46, where the annuli are constructed from material having a dielectric constant less than 4.0 at 1 MHz.

48. The printed wiring board of claim 45, wherein the annuli prevent undesired electrical contact between the linings of the through holes and the electrically and thermally conductive laminates.

49. A method of constructing a printed wiring board having circuits patterned onto its outer surfaces and circuits patterned on interior layers of conductive material, comprising the steps of:



constructing a model of the printed wiring board;

determining portions of the outer surface of the printed wiring board that do not contain patterned circuits;

determining drilling locations within said determined portions that do not result in undesired electrical connections with the circuits patterned on the interior layers of the printed wiring board;

constructing the printed wiring board such that said determined portions are plated with thermally conductive material;

drilling holes in the constructed printed wiring board in said determined drilling locations;

and

lining said holes with thermally conductive material.

50. A method of constructing a printed wiring board having an electrically and thermally conductive laminate, a plurality of layers of electrically conductive material that have circuits patterned on them and lined through holes that connect the circuits on the layers of electrically conductive material, comprising the steps of:

constructing a model of the printed wiring board;

constructing said electrically and thermally conductive laminate;

identifying the locations in which the lined through holes intersect the electrically and thermally conductive laminate;

determining whether an electrical connection is desired between the lining of the lined through hole and the electrically and thermally conductive laminate at each of said locations;

if an electrical connection is not desired at said location, then drilling a hole at said location in said electrically and thermally conductive laminate and filling said hole with a dielectric material.

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51. A method of constructing a prepreg, comprising the steps of:

impregnating a substrate with a thermally conductive resin.

52. The method of claim 51, wherein the thermally conductive resin is also electrically conductive.

53. A method of constructing a laminate, comprising the steps of:

impregnating a substrate with a thermally conductive resin to create a prepreg having a top surface and a bottom surface; and

laminating a first layer of electrically conductive material to the upper surface of the prepreg and a second layer of electrically conductive material to the lower surface of the prepreg.

54. The method of claim 53, wherein the thermally conductive resin is also electrically conductive.

55. A method of constructing a printed wiring board, comprising the steps of:

constructing an electrically and thermally conductive laminate having an upper surface and a lower surface;

laminating a first prepreg layer to the upper surface of the laminate and a second prepreg layer to the lower surface of the laminate.

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